other, for many of its contributors have made highly important additions to our knowledge of the growing embryo. The volume is issued by the Carnegie Institution of Washington, under the ægis of which Prof. Mall had established a department of embryology two years before his death.

In these essays we see employed the exact technique which Prof. Mall learned when working under the late Prof. His, of Leipzig, but in addition there is evidence of a clear realisation that embryology is a series of vital processes, and that to understand them the living as well as the dead embryo must be studied. The developing chick lends itself particularly well for vitalistic observation, but we have every reason to suppose that the earlier stages of mammalian development —including the early stages in the growth of the human ovum—can be investigated in a similar manner. In this respect a return has been made to the earlier methods of Harvey and of Hunter.

As examples of the vitalistic method of observation, we may cite papers by Prof. Florence Sabin on "The Origin of Blood-vessels and of Red Blood Corpuscles," by Dr. Eliot R. Clark and Eleanor L. Clark on "The Origin and Early Development of the Lymphatic System," and by Dr. Margaret R. Lewis on "Muscular Contraction in Tissue Cultures." Prof. Sabin shows that blood-vessels arise from islets, or groups, of angioblastic cells, which by canaliculisation and inosculation unite to form a capillary network. The angioblastic cells give rise to the endothelial lining of blood-vessels, and both the angioblasts and endothelial cells can, and do, produce nucleated red blood corpuscles. The lymphatic system of vessels, however, as one is led to infer from the experiments of the two Clarks, arises from the endothelium of the veins in certain embryonic regions, and from these regions, or centres, the endothelial outgrowths invade certain neighbouring areas of the body and thus provide it with a lymphatic system. If one centre of outgrowth is destroyed, neighbouring centres will supply the deficiency.

Another series of papers records observations on the vital reactions of certain cells in the body of adult animals. Capt. Charles Essick found that when a solution containing fine particles was placed in the sub-arachnoid spaces of the brain of a living animal the endothelial cells of these spaces were transformed into phagocytes, which consumed the foreign matter thus introduced. Capt. Essick's investigation was occasioned, apparently, by observations made by Capt. Lewis H. Weed during a research on "The Experimental Production of Hydrocephalus"—an important inquiry which also appears in this memorial volume. To this series also belongs the paper contributed by Dr. Charles C. Macklin on "The Development and Function of Macrophages in the Repair of Experimental Bone-wounds Vitally Stained with Typan-blue." We infer from Dr. Macklin's experiments that the phagocytes which appear at the sites of repair and of rapid growth have, as their chief business, the consumption of tissue-débris and the rendering of that débris fit for return to the general circulation of the body. Dr. George Corner's observations on "The Widespread Occurrence of Reticular Fibrils produced by Capillary Endothelium" serve to enhance the functional importance of the cells which line blood and lymphatic vessels.

Besides these papers on the living behaviour of the tissues of the body, this volume contains important contributions to orthodox or morphological embryology—particularly a most valuable summary of the present state of our knowledge of the youngest known human embryos, given by Prof. George L. Streeter, who succeeded Prof. Mall as director of the department of embryology in the Carnegie Institution of Washington. Dr. Warren H. Lewis's description of the skull of a human fœtus towards the end of the second month of development is also a very welcome addition to our knowledge of the human body. Other papers, like those of Prof. C. R. Bardeen on "The Post-natal Development of the Human Body," Prof. Robert Bean's on "The Post-natal Growth of the Heart, Kidneys, Liver, and Spleen of Man," and Dr. Schultz's "Development of the External Nose of Whites and Negroes," represent contributions to anthropology as well as to embryology. Altogether, this volume represents a worthy memorial to a really great man.

Two Books for the Country.

(1) *Springtime and Other Essays.* By Sir Francis Darwin. Pp. vii + 242 + viii plates. (London: John Murray, 1920.) Price 7*s*. 6*d*. net.

(2) *Memories of the Months.* Sixth series. By the Right Hon. Sir Herbert Maxwell, Bart. Pp. xi + 314. (London: Edward Arnold, 1919.) Price 7*s*. 6*d*. net.

(1) SIR FRANCIS DARWIN'S essays have a peculiar charm; the reader is caught in the current of the author's enjoyment. Uninfluenced by artifice, we find ourselves sharing in his pleasures, and, to begin with, in the delight of the spring renascence. "The spring is the happiest season for those who love plants, who delight to watch and record the advent of old friends as

the great procession of green leaves and beautiful flowers unwinds itself with a glory which no familiarity can tarnish." To a representative list in the order of their flowering, Sir Francis adds the remark: "To a lover of plants, this commonplace list will, I hope, be what a score is to a musician, and will recall to him some of the charm of the orchestra of living beauty that springtime awakens."

The book begins with "Springtime" and ends with "A Procession of Flowers," behind both essays lying the problem of "the elements in the struggle for life which fix the dates on which plants habitually flower." "It looks, to put the thing fancifully, as if a parliament of plants had met and decided that some arrangement must be made, since the world would be inconveniently full if they all flowered at once; or they may have believed that there were not enough insects to fertilise the whole flora, if all their services were needed in one glorious month of crowded life. Therefore it was ruled that the months should be portioned among the aspirants, some choosing May, others June or July. But it must have been difficult to manage, and must have needed an accurate knowledge of their own natural history." Similar touches of wise humour are not rare. "It has been said that Thoreau, the American recluse and naturalist, knew the look of the countryside so intimately that had he been miraculously transferred to an unknown time of year he would have recognised the season 'within a day or two, from the flowers at his feet.' If this is true, either American plants are much more business-like than ours (which is as it should be), or else Thoreau did not test his opinions too severely, and this seems even more probable." For, as a matter of fact, the dates of flowering vary considerably with the temperature and some other environmental variables—a fact which gives subtle value to old-fashioned phenological maxims: "When the sloe tree is as white as a sheet, You must sow your barley be it dry or wet"; "When we hears the wryneck, we very soon thinks about rining (barking) the oaks." "There is," Sir Francis says, "something delightfully picturesque in the thought of man thus helped and guided on some of his most vital operations by the proceedings of the world of plants and animals, to whom that hard taskmaster, Natural Selection, has taught so much."

Another delightful essay discusses the traditional names of English plants. "The fact that language is handed on from one generation to the next may remind us of heredity, and the way in which words change is a case of variation. But we cannot understand what determines the extinction of old words or the birth of new ones. We cannot, in fact, understand how the principle of natural selection is applicable to language: yet there must be a survival of the fittest in words, as in living creatures." The author proceeds to show how "the wonderful romance inherent in the great subject of evolution also illumines that cycle of birth and death to which existing plant-names are due."

This is scarcely the place for an appreciation of the essays on "Some Names of Characters in Fiction" or "Old Instruments of Music," or for those on Sydney Smith and Charles Dickens, but they are not less interesting than those on Sir Joseph Dalton Hooker and Sir George Biddell Airy. In connection with the last, we looked for some remark on the astronomer's paper on phyllotaxis, which seemed to us particularly luminous many years ago, but we were disappointed. Very delightful are the author's personal recollections, especially of his early years. We have not the courage to write in NATURE of the way in which Francis Darwin expressed in the church at Down his innate fondness for musical instruments; but we are within safe natural history lines in quoting the next two sentences: "The only other diverting circumstance was the occurrence of book-fish [Lepisma?] in the prayer-books or among the baize cushions. I have not seen one for fifty years, and I may be wrong in believing that they were like minute sardines running on invisible wheels." One more quotation from a fascinating book, and we have done: "I continued to work with my father at Down, and in spite of the advantages I gained by seeing and sharing in the work of German laboratories, I now regret that so many months were spent away from him."

(2) Sir Herbert Maxwell has given us a sixth volume of his "Memories of the Months," and it will be as much appreciated as its predecessors. It consists, for the most part, of evening recollections of the natural history experiences of the day. The breezes play with the pages. For while the author is often erudite he never wears his learning but lightly. The year begins with winter flowers and winter visitors, with the humble leek which Nero is said to have loved, and with good-going problems like the significance of the white disc on the roe-deer's rump or the rabbit's cotton-tail. The temperature rises, and we have daffodils and birds' nests and the puzzles of the cuckoo and the corncrake. In speaking of the frog-hopper, the author slips in calling it a diminutive member of the grasshopper family, and his story of the

foam-making is not quite accurate. But this is merely a crumpled rose-leaf. Summer's memories deal with butterflies, British orchids, the behaviour of a hunter-wasp, the ways of char, and the insurgence of climbing plants. Here also is included an unashamed confession of faith in the powers of the divining rod. In the fall of the year Sir Herbert discourses on gossamer and migration; in midwinter he brings us up against such problems as the otter's survival in the hard months and the general question of animal intelligence. In connection with animal behaviour, the author inclines, if we understand him rightly, to a somewhat remarkable transcendental conclusion, that conscious intelligence is "the consequence of an external and superior mandate or suggestion, acting upon a suitable physical receptacle." "Assuming a First Cause, instinctive activities in the lower animals may be regarded as the comparatively simple and intelligible results of forces initiated by him, acting unerringly in prescribed directions by means of co-ordinate organs modified by evolution." In short, this lifelong student of the ways of living creatures is frankly dualistic. But he does not seek to ram his philosophy down the reader's throat.

We notice a few slips in the pages; thus Fabre's volumes are referred to as "Etudes Entomologiques," and again as "Mémoires Entomologiques," whereas the title was surely neither. But such slips are trivial in a book of great attractiveness. It is full of interesting observations; it expresses and arouses the inquiring spirit. Its happy style suggests that the writing of it must have been a pleasure, and that is certainly true of the reading. We wish there had been an index, for the topics touched on are numerous.

Principles of Aeronautics.

Aeronautics: A Class Text. By Prof. E. B. Wilson. Pp. vii+265. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) Price 22*s.* net.

THE work under notice differs considerably in conception and treatment from that usually associated with the title "aeronautics." It is very clearly written, and will be particularly valuable to advanced students of the subject for many reasons. On the other hand, it will not appeal strongly to the less advanced worker who delights to regard himself as "practical," for he will find only a "skeleton airplane" of the simplest type as a basis for all the calculations made. The more usual curves by which laboratory results are expressed are subordinated to analytical expressions. The peculiar advantages of this point of view are obvious in many places, notably in the treatment of the fall of bodies through air. Without containing such original matter as that of Bryan in "Stability in Aviation," the new volume expresses ideas more nearly those of Bryan than of any other writer on the subject.

The introduction to the book includes the ideas underlying simple flight and the aerodynamics of aerofoils, and the chapters of this section are probably of little importance. It is with the chapter on "Motion in Two Dimensions" that the serious student of aeroplane motion will begin to appreciate the book, for here are collected with concise proofs the fundamental theorems in dynamics which are otherwise only to be found by perseverance in the reading of such volumes as Routh's "Rigid Dynamics." The principles are carried step by step to the consideration of stability, and are then illustrated by example. The study of motion in three dimensions is committed to a following chapter, and starts from the apparently simpler problems relative to fixed axes and uses these as a basis for developing the theorems for moving axes. The reasons for the ultimate simplicity of the latter in relation to complex motions are given, and the treatment is direct and helpful. The last chapter in the section devoted to rigid dynamics applies the equations developed to the stability of the aeroplane. The stage reached is not further than that of English workers, and is obviously dependent on the latter for much of its inspiration; but the chapters are more complete and self-contained than any others available at the moment.

The rest of the book is devoted to "Fluid Mechanics," and here are interposed chapters on the simpler theories generally known as "hydraulics" and the more complex and unfortunately less applicable theorems of velocity potential, etc., of hydrodynamics. The ninth chapter introduces the fundamental laws of laminar motion, and develops the formula for an adiabatic atmosphere. Then follow the important Bernoulli's theorem and the Rayleigh expansion, which indicates the velocity at which air must be considered as a compressible fluid so far as the effect on the resistance of bodies moving through it is concerned. From Bernoulli's equation the laws for Pitot and Venturi tubes are developed on standard lines. Viscous fluids are dealt with in steady motion up to the calculations relating to Poisseuille's famous experiments, and a table of coefficients of viscosity is given.

The fundamental principles of dynamical simi-